

Hydrodynamics.

Hydrodynamics. By Dr. Horace Lamb. Fifth edition. Pp. xvi + 687. (Cambridge: At the University Press, 1924.) 45s. net.

LAMB'S text-book has long been the chief storehouse of information of all workers in hydrodynamics. One may note that the interval between the first and second editions was 16 years, and that successive editions have followed at intervals of 11, 10, and now 8 years respectively. Perhaps the steady decrease is to be attributed to the development of interest in the subject, which has during the last ten years come into closer relation with experience than the most optimistic student could have anticipated previously. In any case, the fifth edition is welcome, for it contains not only all the good features of its predecessors, but also most valuable accounts of recent discoveries. Dr. Lamb's alertness to modern advances may be estimated from the fact that ten entries relating to Prof. G. I. Taylor occur in the index. Abundant references to original papers are given in the footnotes.

A new section (91a) gives a short account of the expansion of a spherical cavity in water due to an internal explosion, and of the collapse of an exhausted cavity. Section 159a deals with the two-dimensional motion of solids in a liquid with uniform vorticity. Section 205a gives a new theorem relating to small oscillations of a gyrostatic system about a steady motion. Rayleigh proved that the normal modes of vibration of a non-gyrostatic system were those that made the periods stationary for small variations in the adopted ratios of the co-ordinates. Lamb here proves the corresponding theorem for a gyrostatic system.

The account in Section 284 of the propagation of a wave of discontinuity in air has been much improved by the inclusion of a discussion of the modification introduced by conduction, with an estimation of the extent of the region of transition. Section 330a describes the theory of a case of lubrication. In Section 334a several cases of the transference of momentum in a viscous fluid in a non-steady state are worked out, and also the theory of the maintenance of an ocean current by a steady wind blowing over the surface. The effect of porous bodies in absorbing sound is discussed in Section 360a. A few simple cases of turbulent motion are treated in Section 366a, b, and c. The nature of the theory of the motion of solids in a real fluid is outlined in Section 372a and b. A new section at the beginning of the chapter on rotating masses of fluid gives proofs of the theorems of Poincaré and Lichtenstein on the possible modes of rotation

of a fluid mass. Two slips of the pen which have been noticed are, on p. 643, 2.2×10^{19} is printed instead of 1.1×10^{19} , and, on p. 648, $-\omega^2 z$ appears instead of 0 for the z acceleration.

A few remarks concerning Dr. Lamb's use of the reversed sign for the velocity potential may not be out of place. He justifies this course on two grounds. First, it gives the velocity potential the same sign as the impulsive pressure needed to start the motion; second, it completes analogies with other branches of mathematical physics. Neither of these arguments appears to the reviewer to have much weight. From analogy with elasticity, where the positive stress and strain both correspond to an extension, an impulsive tension appears to be a more suitable standard than an impulsive pressure, and the velocity potential without reversal has the same sign as the impulsive tensions. The use of pressure instead of tension in hydrodynamics arises from the fact that it is usually (though not always) the pressure that is positive in fluids; the adaptation of the sign of the velocity potential to this fact tends to obscure the physical analogy between elasticity and hydrodynamics. Again, while the reversed sign agrees with the usual practice in electrostatics, it disagrees with that usual in gravitational theory, which is more closely associated with actual hydrodynamic problems. In each of these cases the current convention has been adopted purely in order to reduce the number of times the minus sign has to be written; which is in itself a reason for not reversing the sign of the velocity potential.

H. J.

Psychical Research.

Experiences in Spiritualism with D. D. Home. By the Earl of Dunraven. Pp. iv + 285. (London: Society for Psychical Research, 1924.) 7s. 6d.

THIS book ought to have been published long ago. In a way indeed it was, to wit in 1870, but only for private circulation, on account of the violent prejudices which its subject then excited both in religious and in scientific circles. It is a record of the marvels which seemed to those present to happen in connexion with D. D. Home, the most famous "medium" of modern times, and is composed mainly of reports, written by the present Earl of Dunraven, then Viscount Adare, to his father, on seventy-eight sittings with Home in the years 1867-69; but in ten cases the notes were taken by the late Earl, who also wrote an introduction. The present Earl has now reprinted the material and equipped it with a preface, and with a lucid and temperate introduction by Sir Oliver Lodge; but he has not attempted to fill in the

gaps which were left in the evidence where matters were considered too intimate for publication. After a lapse of more than fifty years, most of these could surely have been filled in without offence, and thus have counteracted the attenuating effect which the mere lapse of time has on the scientific value of any historical narrative. Nor is the recording itself as full and expert as Crookes's account of his experiments with the same medium.

Nevertheless, Lord Dunraven has put under a deep obligation all students of the secular struggle between the champions of "law," convention, prejudice, scepticism, conservatism, on one hand, and of "fact," eccentricity, open-mindedness, credulity, revolution, on the other. The continuance of this struggle is due to the fact that the progress of knowledge demands a co-operation of both these tendencies, so that neither can lay exclusive claim to the term "scientific"; while the question as to which party is right cannot be settled by any appeal to general principles, but only (if at all) by patient and prolonged examination of each case.

All this applies with peculiar force to "spiritualism," which excites strong emotions on both sides, and displays a dramatic clash between established principles and subversive testimony. But it would be utterly unscientific to burke investigation on this account, after the fashion of Hume, by declaring that "miracles" are alleged, and that miracles are impossible. This is mere *a priori* dogmatism, which is discreditable alike to philosophy and to science.

It may be that the times are not yet ripe for a truly scientific inquiry into the facts alleged; certainly neither party as yet welcomes examination. The man of science professes to be more interested in, say, the nephridia of worms than in the immortality of his soul, while the spiritualist, though he rests his case on observable facts, fights singularly shy of test conditions. Even when a "medium" can be got to submit to examination, it is usually hard to find a man of science who will conduct it; as was recently shown when, in spite of a handsome salary, such a post went a-begging, until a physicist already compromised by interest in the supernormal accepted it, and speedily exploded a famous medium.

Perhaps the truth of the matter is that both sides are not quite sure of their ground and afraid to test their convictions. Still, one cannot read Lord Dunraven's book without feeling that progress is being made, though slowly; perhaps it is not too much to hope that, in another fifty years, science will have given an explanation satisfactory to both the scientific worker and the spiritualist of the mysteries that are still in dispute.

F. C. S. S.

Our Bookshelf.

The Morphology and Evolution of the Apes and Man.
By Dr. Charles F. Sonntag. Pp. xi + 364. (London: J. Bale, Sons and Danielsson, Ltd., 1924.) 12s. 6d. net.

FULLY sixty years ago, Huxley systematised our knowledge of the anatomy and nature of anthropoid apes in a famous treatise to which he gave the title "Evidence as to Man's Place in Nature." Anatomists have been busy since then; there has been an enormous output of papers relating to the anatomy of apes, and there has grown up a great need for an ordered presentation and interpretation of the new material.

Dr. Charles F. Sonntag, Prosector to the Zoological Society of London, has stepped into the breach and sought to supply this need in "The Morphology and Evolution of the Apes and Man." This book, Dr. Sonntag informs us in his preface, "is intended to serve as an introduction to Anthropology, for it deals with the first steps in that science, namely the relations of Man to lower animals."

The scope of Dr. Sonntag's treatise is best indicated by citing the contents of its chapters. Chapter i. is devoted to a systematic account of lemurs and Tarsius, Chapter ii. to the New World monkeys, Chapter iii. to the Old World monkeys. Then follow nine chapters on the anthropoid apes. One is devoted to a description of their external characters, habits, and classification; then follow others in which plain accounts are given of their skeletons and teeth, of their muscles, of their organs of digestion, of their organs of circulation, of their respiratory systems, of their urino-genital systems, and of their nervous systems. In all of these chapters, Dr. Sonntag keeps his personal opinions in the background, being content to play the part of descriptive anatomist, leaving the interpretation of his facts to others.

In a final chapter a brief account is given of the evolution of the primates, the text of this chapter being greatly assisted by a clearly drawn phylogenetic tree. In this chapter, as in others, Dr. Sonntag is an eminently safe guide for both student and expert, for he has preferred to give a detailed account of the anatomy of apes, rather than to discuss the problems relating to their origin. Anatomists are indebted to Dr. Sonntag for this work, particularly for the full bibliography which is appended.

Institution of Petroleum Technologists. Standard Methods of Testing Petroleum and its Products. Pp. x + 102. (London: Institution of Petroleum Technologists, 1924.) 6s. net.

THE Committee appointed by the Institution of Petroleum Technologists to standardise methods of oil-testing has, under the above title, published its first report in the form of a concise manual. It was no easy task to criticise existing methods, to comment on relative advantages and disadvantages inherent thereto, to keep pace with current developments, and at the same time to issue an authoritative work formulating agreed methods of oil-analysis consistent with home and foreign procedures; but the Committee has